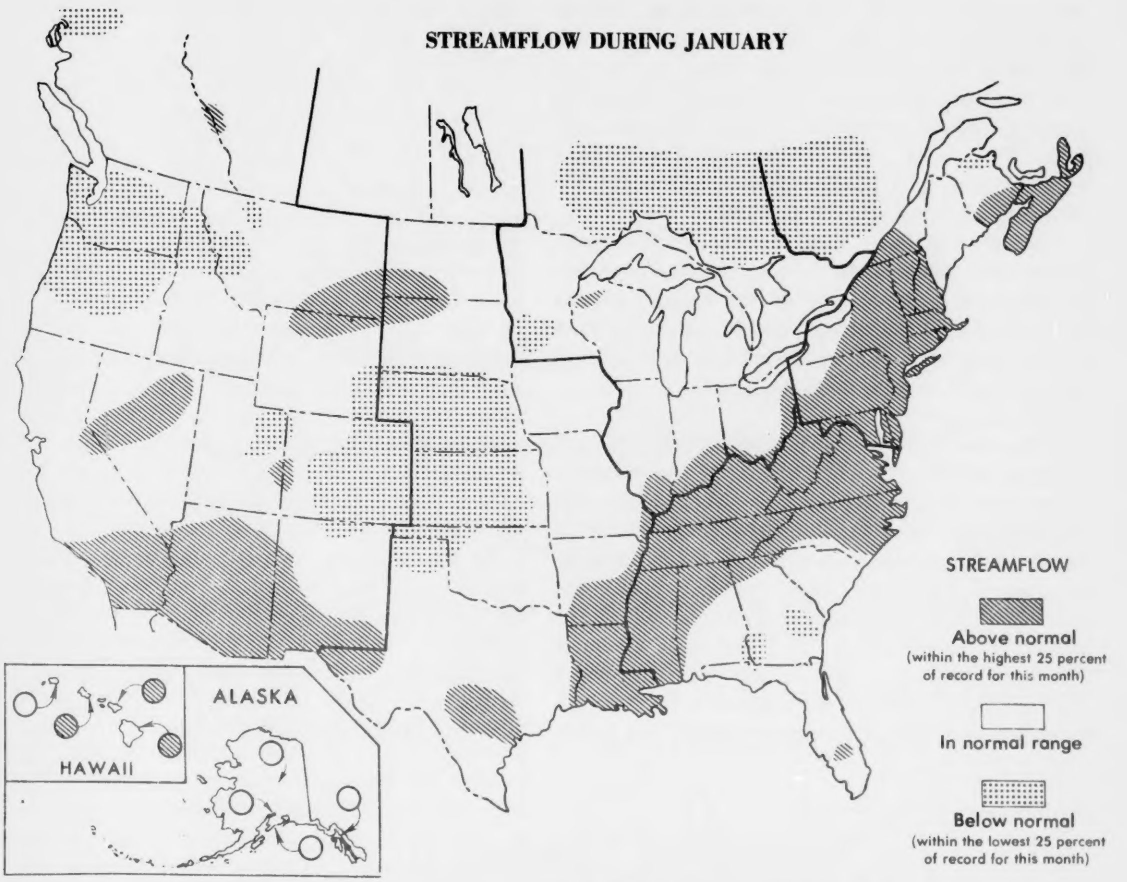
WATER RESOURCES REVIEW for JANUARY 1979

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANADA
DEPARTMENT OF THE ENVIRONMENT
WATER RESOURCES BRANCH

STREAMFLOW DURING JANUARY



STREAMFLOW AND GROUND-WATER CONDITIONS

Streamflow generally increased seasonally in California, Nevada, in southern parts of the Midcontinent, Northeast, and Western Great Lakes Regions, and throughout most of the Southeast Region. Above-normal streamflow occurred in large parts of the Northeast and Southeast Regions where monthly mean flows were highest of record for the month in many States. Monthly mean flows generally decreased seasonally in Alaska, southern Canada, and in most northern States of the Midcontinent and West Regions.

Below-normal streamflow persisted in a large area in and adjacent to western Kansas, and also in parts of southeastern Canada, Georgia, Idaho, Minnesota, Montana, Oregon, Utah, and Washington.

Flooding occurred in Connecticut, Indiana, Louisiana, Massachusetts, Mississippi, Nevada, New Jersey, North Carolina, Pennsylvania, Rhode Island, Virginia, and West Virginia as a result of above normal precipitation.

Ground-water levels rose in most of the Northeast and Southeast Regions, and above-average levels prevailed. Trends were mixed in the Western Great Lakes Region, where levels were largely above average, and mixed in the Midcontinent Region, where they were mostly below average. Trends were mixed in the West, and levels were both above and below average.

Several new high ground-water levels for January occurred in Connecticut, Kentucky, Massachusetts, and Rhode Island. New low levels of record for January occurred in Arizona, Arkansas, Idaho, Kansas, Louisiana, Montana, Nevada, New Mexico, Tennessee, and Texas. An alltime low level was reached in the Texas Panhandle.

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

Streamflow generally increased throughout the region except for parts of Pennsylvania and Quebec. Monthly mean flows remained in the below-normal range in parts of New Brunswick and Quebec, and remained in the above-normal range in parts of Pennsylvania. Monthly mean discharges increased into the above-normal range throughout the region except for Maine and parts of New Brunswick and Quebec. Mean flows were highest of record for the month in parts of Connecticut, Massachusetts, New Jersey, New York, and Rhode Island. Flooding occurred in Connecticut, Massachusetts, New Jersey, Pennsylvania, and Rhode Island.

Ground-water levels rose in most of the region, substantially in some wells. Levels became above average in many areas, including most of New England. In parts of Connecticut, Massachusetts, and Rhode Island, levels in some wells were near or exceeded the highest levels recorded in the past 30 years.

Heavy rains during the period January 21–25 caused moderate to severe flooding in parts of Rhode Island, central and eastern Massachusetts, Connecticut and adjacent Long Island, and northern New Jersey. Seven counties in Massachusetts were declared disaster areas by the Federal Government and estimates of damage exceeded $6 million in Rhode Island and more than $30 million in Massachusetts. Peak discharges at many stream-gaging stations in the area were greater than those of a 100-year flood at the respective sites. Selected data on stages, discharges, recurrence intervals, and gaging station locations, are given in the accompanying map and table (on pages 3 and 4).

Record-breaking monthly and daily mean discharges also occurred at many index stations in the southeastern part of the region. For example, the January monthly mean discharge of 811 cfs in Branch River at Forestdale, Rhode Island (drainage area, 91.2 square miles) was highest for any month, and the daily mean of 3,600 cfs on January 25 was second highest for any month and highest for January in 40 years of record. In Massachusetts, the monthly mean discharge of 502 cfs at the index station, Ware River at Intake Works near Barre (drainage area, 96.8 square miles) was highest in 51 years of record. In Connecticut, the monthly mean discharges of 1,171 cfs on Salmon River near East Hampton (drainage area, 102 square miles), and 531 cfs on Pomperaug River at Southbury (drainage area, 75.0 square miles), in southeastern and southwestern parts of the State, were highest in 51 and 47 years of record, respectively. On Long Island, New York, the monthly mean discharge of 33.4 cfs and the daily mean of 191 cfs on the 21st at Massapequa Creek at Massapequa (drainage area, about 38 square miles) were highest for January in record that began in 1936. In northern New Jersey, the monthly mean flow of 453 cfs and the daily mean discharge of 2,850 cfs on January 25 were highest for the month in 61 years of record at South Branch Raritan River near High Bridge (drainage area, 65.3 square miles).

In Maryland and Delaware, streamflow increased seasonally and was above the normal range throughout the bistate area. In central Maryland, the monthly mean discharge of 395 cfs at Seneca Creek at Dawsonville (drainage area, 101 square miles) nearly equaled the maximum of record for January—397 cfs in 1978. Record at Dawsonville began in 1930.

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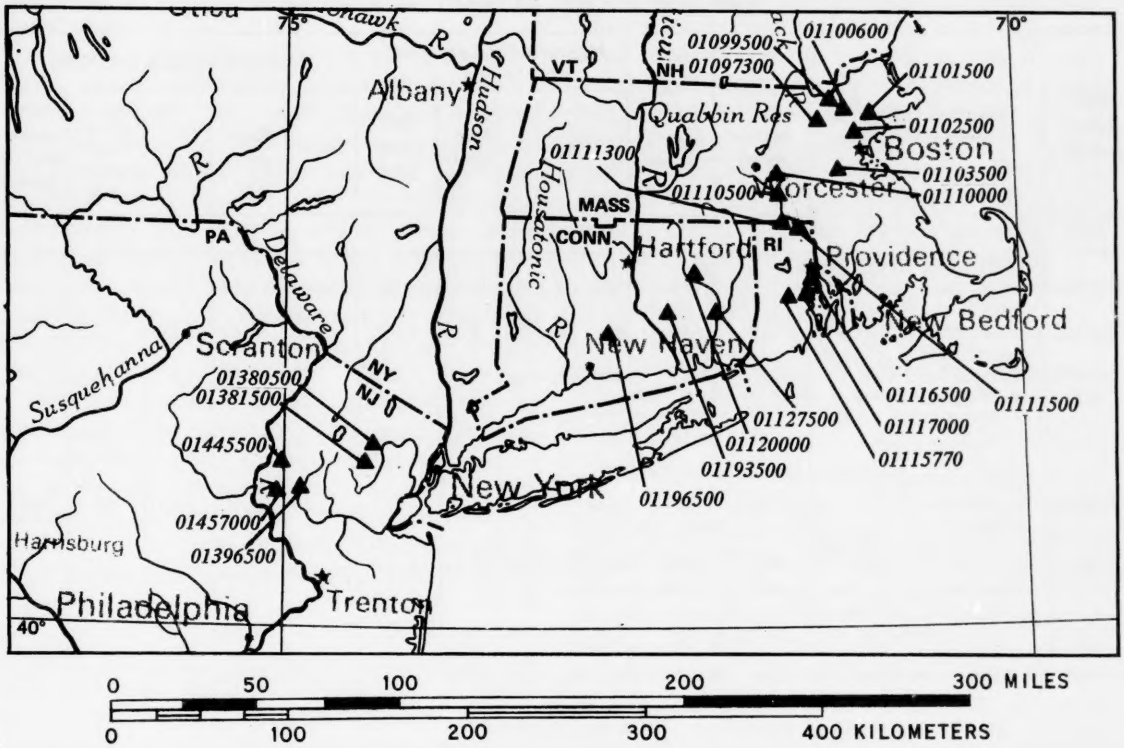
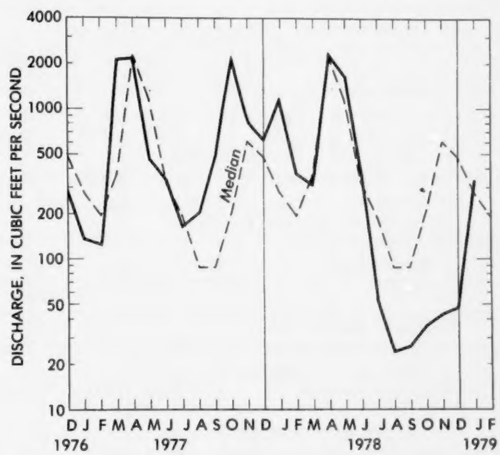


Location of stream-gaging stations in Massachusetts, Rhode Island, Connecticut, and New Jersey, described in table of peak stages and discharges.

In southwestern Pennsylvania, high carryover flow from December, augmented by runoff from thunderstorms during January, resulted in above-normal monthly mean discharge in Monongahela River at Braddock for the 2d consecutive month. In the east-central part of the State, mean flow in Susquehanna River at Harrisburg increased seasonally to nearly 3 times median and was above the normal range as a result of runoff from precipitation amounts for January that exceeded National Weather Service records for that site. Bankfull stages along several tributaries to the Susquehanna River were reported during the period January 24–26 with moderate flooding occurring along Swatara Creek at Harper Tavern where a 12-year flood event was recorded.

In New York, Vermont, and New Hampshire, monthly mean flows generally increased unseasonally at all index stations and were above the normal range, but less than twice the median flows for January.

In central Maine, where monthly mean discharge in Piscataquis River near Dover-Foxcroft was below the normal range for 6 consecutive months during the period July-December 1978, and lowest of record during August and December of that year, streamflow increased sharply, was 124 percent of the January median discharge, and within the normal range. (See graph.) Elsewhere in the State, mean flows at index stations



Monthly mean discharge of Piscataquis River near Dover-Foxcroft, Maine (Drainage area, 297 sq mi; 769 sq km)

FLOOD DATA FOR SELECTED SITES IN MASSACHUSETTS, RHODE ISLAND, CONNECTICUT, AND NEW JERSEY, JANUARY 1979

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
	MASSACHUSETTS										
	MERRIMACK RIVER BASIN										
01097300	Nashoba Brook near Acton.	12.7	1963–	Mar. 19, 1968	5.07	360	Jan. 26	5.73	802	63.1	100
01099500	Concord River below River Meadow Brook at Lowell.	312	1936–	Mar. 22, 1968	9.16	4,800	28	9.60	5,410	17.3	......
01100600	Shawsheen River near Wilmington.	35.3	1963–	Mar. 19, 1968	8.60	1,050	26	9.80	1,640	46.5	80
	IPSWICH RIVER BASIN										
01101500	Ipswich River at South Middleton.	43.4	1938–	Mar. 19, 1968	7.09	833	26	7.10	835	19.2	30
	MYSTIC RIVER BASIN										
01102500	Aberjona River at Winchester.	24.2	1939–	Aug. 19, 1955	13.64	835	25	15.46	[1] 1,400	58	>100
	CHARLES RIVER BASIN										
01103500	Charles River at Charles River Village.	184	1937–	Aug. 23, 1955	9.24	3,220	28	8.36	3,000	16.3	50
	BLACKSTONE RIVER BASIN										
01110000	Quinsigamond River at North Grafton.	25.5	1939–	Aug. 20, 1955	5.15	820	26	4.59	675	26.5	100
01110500	Blackstone River at Northbridge.	139	1939–	Aug. 20, 1955	16.74	16,900	25	12.48	6,200	44.6	100
	RHODE ISLAND										
	BLACKSTONE RIVER BASIN										
01111300	Nipmuc River near Harrisville.	16.0	1968–	Mar. 18, 1968	7.42	1,020	Jan. 25	8.53	1,840	115	50
01111500	Branch River at Forestdale.	91.2	1936, 1940–	Mar. 19, 1936	.....	5,800	25	11.80	5,470	60.0	75
	PAWTUXET RIVER BASIN										
01115770	Carr River near Nooseneck.	6.73	1963–	Mar. 18, 1968	6.50	221	21	5.87	250	37.1	100
01116500	Pawtuxet River at Cranston.	200	1939–	Mar. 18, 1968	11.53	3,110	26	13.26	4,000	20.0	100
	POTOWOMUT RIVER BASIN										
01117000	Potowomut River near East Greenwich.	23.0	1940–	Mar. 18, 1968	3.36	866	21	3.42	804	35.0	100
	CONNECTICUT										
	THAMES RIVER BASIN										
01120000	Hop River near Columbia . .	74.8	1933–	Sept.21, 1938	16.25	6,450	Jan. 25	15.14	5,500	73.5	37
01127500	Yantic River at Yantic	90.0	1930–	Sept.21, 1938	14.66	13,500	25	12.42	8,300	92.2	50
	CONNECTICUT RIVER BASIN										
01193500	Salmon River near East Hampton.	102	1928–	Sept.21, 1938	10.96	12,400	25	12.67	12,000	118	100
	QUINNIPIAC RIVER BASIN										
01196500	Quinnipiac River at Wallingford.	110	1930–	Sept.21, 1938	10.55	5,230	25	12.93	[2] 5,600	......	100
	NEW JERSEY										
	PASSAIC RIVER BASIN										
01380500	Rockaway River above Reservoir, at Boonton.	116	1937–	June 2, 1952	6.62	3,510	Jan. 25	7.06	4,300	37.1	40
01381500	Whippany River at Morristown.	29.4	1921–	Aug. 28, 1971	7.60	2,280	25	7.40	2,830	96.3	100
	RARITAN RIVER BASIN										
01396500	South Branch Raritan River near High Bridge.	65.3	1918–	Mar. 15, 1940	11.78	5,160	25	12.07	6,360	97.4	100
	DELAWARE RIVER BASIN										
01445500	Pequest River at Pequest . .	108	1921–	Mar. 14, 1936	4.97	1,810	25	5.97	2,250	20.8	100
01457000	Musconetcong River near Bloomsbury.	143	1903–07, 1921–	Oct. 10, 1903	8.00	6,960	25	8.6	8,600	60.1	>100

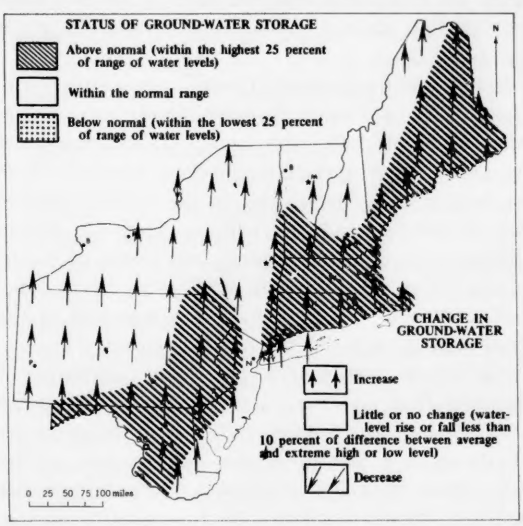
[1] About.
[2] Result of dam failure.

increased, were near or above median, and within the normal range.

In southern New Brunswick and throughout Nova Scotia, monthly mean flows were unseasonally high ranging from 2 to 3 times median flows and were well above the normal range. The above-normal streamflows were the result of mild temperatures and record high cumulative precipitation which resulted from five major storms during the month. In contrast, monthly mean flow at the index station, Upsalquitch River at Upsalquitch, in northern New Brunswick, remained in the below-normal range for the 6th consecutive month and was less than 50 percent of the January median discharge.

In Quebec, streamflow generally decreased seasonally and was below the normal range at all index stations in the southwestern part of the Province that were north of the St. Lawrence River. For example, monthly mean discharge in Harricana River at Amos continued to decrease seasonally and remained in the below-normal range for the 3d consecutive month. South of the St. Lawrence River in southern Quebec, mean flow at the index station, St. Francois River at Hemmings Falls, increased sharply into the above-normal range and was more than twice the January median flow. In eastern parts of the Province, streamflow generally decreased but remained in the normal range at index stations on Matane River near Matane and Outardes River at Outardes Falls.

Ground-water levels rose in nearly the entire region. (See map.) Some rises were substantial, reflecting major recharge of the water table by rainfall and sometimes by melted snow and ice. End-of-month levels were above average in New England (except in some northern areas) in contrast to the below-average conditions of recent months. Levels in some wells in Connecticut, Massachusetts, and Rhode Island reached or exceeded the highest levels recorded in 30 years. Levels on parts of Long Island, N.Y., were slightly above average––the first time above average in 11 months and only the second time since the drought of the 1960's.



Map shows ground-water storage near end of January and change in ground-water storage from end of December to end of January.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

Streamflow increased seasonally in all States of the region except Kentucky, where mean discharges decreased from the record-high flows of December. Monthly mean discharges remained in the below-normal range in parts of Florida and Georgia, and remained in the above-normal range in parts of Kentucky, Tennessee, Virginia, and West Virginia. Mean flows increased into the above-normal range in parts of Florida, Georgia, Mississippi, and North Carolina, and were highest of record for the month in parts of Florida. Flooding occurred in Mississippi, North Carolina, Virginia, and West Virginia.

Ground-water levels rose in the entire region, except for local declines in southeastern Florida and in a few other places in that State. Levels were generally above average except locally in West Virginia, Tennessee, and Florida. A new January high was reached in Kentucky, and a new January low was recorded in Tennessee.

In southeastern Mississippi, where mean flow of Pascagoula River at Merrill was below the normal range and only 56 percent of median in December, monthly mean discharge increased sharply to 184 percent of median and was above the normal range. In the west-central part of the State, where mean flow of Big Black River near Bovina was only 44 percent of median in December, monthly mean discharge also increased sharply and was 439 percent of the January median. Flooding occurred in several parts of the State and peak discharges generally were equal to those of a 5-year flood event except in the west-central part, where a peak discharge roughly equal to that of a 10-year flood occurred on Pearl River at Jackson, and a peak flow equivalent to that of a 25-year event occurred on Bayou Pierre near Willows. In northeastern Mississippi, mean flow of Tombigbee River at Columbus increased sharply

into the above-normal range, as a result of runoff from rains near monthend, and was 285 percent of the January median discharge.

In the adjacent area of northwestern Alabama, where mean discharge of Tombigbee River at Demopolis lock and dam, near Coatopa, was only 44 percent of median in December, monthly mean flow also increased sharply into the above-normal range, and was 221 percent of median. In the northeastern part of the State, mean flow of Paint Rock River near Woodville also increased sharply, was above the normal range, and was 204 percent of median. Elsewhere in the State, streamflow increased seasonally and was within the normal range.

In Tennessee, monthly mean flows continued to increase seasonally throughout the State, and were in the above-normal range at all index stations. In the western part of the State, mean flow of Buffalo River near Lobelville remained above the normal range, where it has been in 6 of the past 9 months. In eastern Tennessee, monthly mean discharges of French Broad River below Douglas Dam and Emory River at Oakdale were above the normal range for the first time since August 1978. In the central part of the State, mean flow of Harpeth River near Kingston Springs remained in the above-normal range as a result of high carryover flow from December, augmented by increased runoff from rains early in January.

In Kentucky, where flooding occurred in December and monthly mean discharges at the index stations were highest of record for that month, mean flows decreased in January but remained above the normal range. In the south-central part of the State, cumulative runoff of Green River at Munfordville for the first 4 months of the 1979 water year was 389 percent of the median runoff for that period. In northern Kentucky, cumulative runoff of Licking River at Catawba for the same period was 349 percent of median.

In West Virginia, mean flows increased sharply and were above the normal range throughout the State. In the extreme northern part of the State, monthly mean discharge of Potomac River at Paw Paw was 208 percent of median and remained in the above-normal range. In the eastern and southern parts of the State, mean flows of Greenbrier River at Alderson and Kanawha River at Kanawha Falls increased sharply, as a result of runoff from rains January 21 and 22, and were above the normal range. Minor flooding occurred along some small streams in several areas of the State.

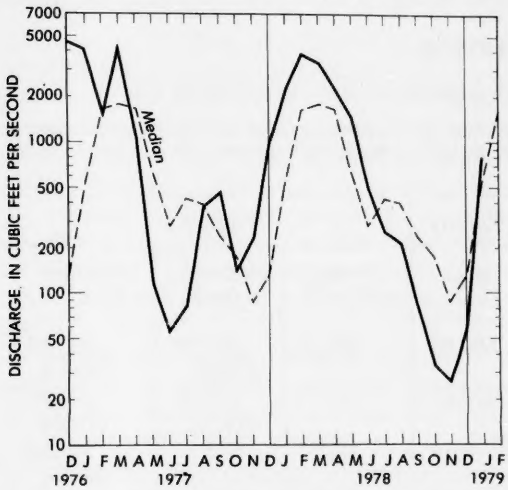
In Virginia, mean flows also increased sharply, as a result of runoff from rains during the 4th week of the month, and were in the above-normal range in all parts of the State. In extreme western Virginia, monthly mean discharge of North Fork Holston River near Saltville increased into the above-normal range and was 279 percent of median. Flooding occurred along that stream, and the peak discharge of 10,100 cfs on January 21 at the Saltville index station was equal to that of a 10-year flood event at that site. In the southeastern part of the State, mean flow of Nottaway River near Stony Creek increased to 2½ times the January median and remained above the normal range. In north-central Virginia, where mean discharge of Rapidan River near Culpeper was about 1½ times median in December, flow continued to increase seasonally in January, and the monthly mean flow was in the above-normal range and was about 2½ times median.

In North Carolina, monthly mean flows continued to increase seasonally and were above the normal range in all parts of the State. In the eastern Piedmont, mean discharges of Neuse River near Clayton and Cape Fear River at William O. Huske Lock near Tarheel increased sharply, as a result of runoff from rains during the 4th week of the month, were in the above-normal range, and were about 2½ times the respective January median flows for those two sites. During the last week of the month, some minor flooding occurred along the major streams in the Coastal Plain. Similarly, mean discharges increased sharply and were above the normal range in French Broad River at Asheville, in the Tennessee River basin in extreme western North Carolina, and in South Yadkin River near Mocksville, in the west-central Piedmont. Minor flooding occurred along some small tributaries in the Tennessee River basin as well as in the Piedmont.

In eastern South Carolina, mean flows in Lynches River at Effingham and Pee Dee River at Peedee continued to increase seasonally and remained within the normal range.

In extreme northwestern Georgia, mean discharge of Etowah River at Canton increased sharply, as a result of increased runoff from rains January 21, and was above the normal range for the first time since August 1978. In the Apalachicola River basin, in the extreme western part of Georgia and the adjacent areas of eastern Alabama and northern Florida, mean flow of Apalachicola River, as measured at Chattahoochee, Fla., continued to increase seasonally but remained in the below-normal range and was only 58 percent of median. Similarly, in eastern Georgia, mean discharge of Altamaha River at Doctortown continued to increase seasonally but remained below the normal range for the 5th consecutive month. In the southern part of the State, where mean flow of Alapaha River at Statenville was in the below-normal range for 5 consecutive months,

August through December, 1978, mean discharge increased sharply, and was in the normal range. (See graph.)



Monthly mean discharge of Alapaha River at Statenville, Ga.
(Drainage area, 1,400 sq mi; 3,630 sq km)

In the Suwannee River basin of northeastern Florida and the adjacent area of Georgia, mean flow of Suwannee River at Branford, Fla., increased seasonally and was within the normal range but was less than median for the 5th consecutive month. In northwestern Florida, monthly mean discharge of Shoal River near Crestview increased seasonally and was slightly greater than median but remained within the normal range for the 5th consecutive month. In the southern part of the State, upstream from Lake Okeechobee, the monthly mean discharge of 783 cfs in Fisheating Creek at Palmdale (drainage area, 311 square miles) was highest for the month since records began in April 1931. In east-central Florida, mean flow of St. John River at Christmas increased sharply and was above normal for the month. In the west-central part of the State, monthly mean discharge of Peace River at Arcadia also increased sharply, as a result of runoff from rains at midmonth, and was in the normal range after 4 consecutive months of monthly mean flows in the below-normal range.

Ground-water levels rose in most of West Virginia; levels were below average in the north-central to southeastern third of the State, and were above average elsewhere. Levels in Kentucky generally rose and were above average statewide. A new January high was recorded in the key well at Louisville, in 33 years of record, despite a very slight net decline during the month. In Virginia, levels rose and were above average, owing to twice the usual January precipitation. In western Tennessee, the artesian level in the key well in the "500-foot sand" near Memphis rose slightly but continued nearly 16 feet below average and at a new January low in 38 years of record, reflecting the general decline in pressure levels caused by continued heavy municipal pumping. In North Carolina, levels rose and were above long-term averages across the entire State. Levels in Mississippi rose moderately, indicating slight recovery during the month. In Alabama, levels rose 1 to 2 feet and were near average. In the Piedmont area of Georgia, levels rose as much as 2 feet during January. In the coastal counties, levels in the principal artesian aquifer rose up to 5 feet. In the southwest, levels rose as much as 8 feet. In Florida, levels rose in most areas in northern and central parts of the peninsula. Levels were below average in most areas except in the extreme northwest near Pensacola. In southeastern Florida, levels declined slightly, although levels rose slightly in Martin and Palm Beach Counties. Levels were mixed with respect to average.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

Streamflow increased seasonally in Ohio and Indiana, was variable in Illinois and Michigan, and generally decreased elsewhere in the region. Monthly mean flows remained in the above-normal range in parts of Indiana and Ohio, and increased into that range in parts of Illinois and Wisconsin. Below-normal streamflow persisted in parts of Minnesota. Flooding occurred in parts of Indiana.

Ground-water levels rose and were at or above average in Indiana and Ohio, declined and were above average in Wisconsin, and declined and were above average in Michigan except in the southern Lower Peninsula, where levels rose. Trends and levels with respect to average were mixed in Minnesota.

In central Minnesota, where monthly mean flow in Crow River at Rockford was above the normal range for the past 6 consecutive months, flow decreased seasonally to 158 percent of median in January and was within the normal range. In southwestern Minnesota, flow of Minnesota River at the index station near Jordan continued to decrease seasonally, remained below the normal range and about 60 percent of median, for the 3d consecutive month. At other index stations in the State, mean flows were near median and within the normal range. Snow cover varied from 10 to 34 inches with the southeast area having the greater snow cover.

(Continued on page 9.)

SELECTED DATA FOR THE GREAT LAKES, GREAT SALT LAKE, AND OTHER HYDROLOGIC SITES

GREAT LAKES LEVELS

Water levels are expressed as elevations in feet above International Great Lakes Datum 1955

(Data furnished by National Ocean Survey, NOAA, via U.S. Army Corps of Engineers office in Detroit. To convert data to elevations above mean sea level datum of 1929, add the following values: Superior, 0.96; Michigan-Huron, 1.20; St. Clair, 1.24; Erie, 1.57; Ontario, 1.22.)

Lake	January 31, 1979	Monthly mean, January		January		
		1979	1978	Average 1900–75	Maximum (year)	Minimum (year)
Superior (Marquette, Mich.)	599.88	600.00	600.89	600.34	601.33 (1975)	598.58 (1926)
Michigan and Huron (Harbor Beach, Mich.)	578.38	578.38	578.38	577.72	579.92 (1973)	575.39 (1965)
St. Clair (St. Clair Shores, Mich.)	573.79	574.02	574.59	572.51	575.37 (1974)	569.86 (1936)
Erie (Cleveland, Ohio)	570.46	570.50	571.26	569.74	572.39 (1973)	567.62 (1935)
Ontario (Oswego, N.Y.)	244.51	244.19	245.88	243.99	246.10 (1946)	241.67 (1935)

GREAT SALT LAKE

Alltime high: 4,211.6 (1873). Alltime low: 4,191.35 (October 1963).	January 31, 1979	January 31, 1978	Reference period 1904–78		
			January average, 1904–78	January maximum (year)	January minimum (year)
Elevation in feet above mean sea level:	4,198.75	4,199.10	4,198.1	4,204.40 (1924)	4,191.90 (1964)

LAKE CHAMPLAIN, AT ROUSES POINT, N.Y.

Alltime high (1827–1977): 102.1 (1869). Alltime low (1939–1977): 92.17 (1941).	January 30, 1979	January 31, 1978	Reference period 1939–75		
			January average, 1939–75	January max. daily (year)	January min. daily (year)
Elevation in feet above mean sea level:	95.56	98.12	95.27	98.37 (1974)	93.56 (1948)

FLORIDA

Site	January 1979		December 1978	January 1978
	Discharge in cfs	Percent of normal	Discharge in cfs	Discharge in cfs
Silver Springs near Ocala (northern Florida)	750	95	780	640
Miami Canal at Miami (southeastern Florida)	398	190	312	272
Tamiami Canal outlets, 40-mile bend to Monroe	58	170	58	60

(Continued from page 7.)

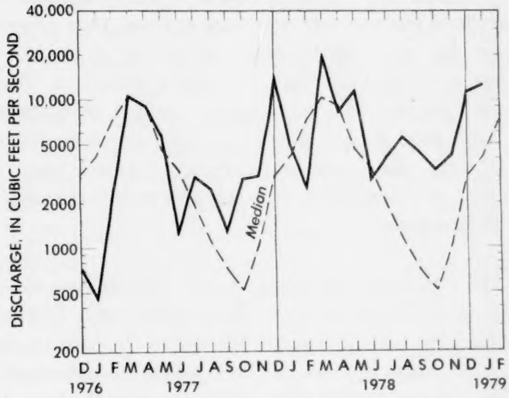
In Wisconsin, streamflow generally decreased seasonally except where flow was regulated. In the northwestern part of the State, mean flow in Jump River at Sheldon decreased seasonally but was above the normal range, partly as a result of high carryover flow from December. In eastern Wisconsin, mean flow in Fox River at Rapide Croche Dam, near Wrightstown, which is regulated, decreased in contrast to the normal seasonal trend of increasing flow, but remained in the normal range. In the central part of the State, mean flow in Wisconsin River at Muscoda, which also is regulated, increased and remained above median but in the normal range.

In southwestern Ontario, monthly mean flow in English River at Umfreville continued to decrease seasonally and remained below the normal range for the 2d consecutive month. In the eastern part of the Province, monthly mean discharge of Missinaibi River at Mattice decreased seasonally to 72 percent of median and also remained in the below-normal range. In southeastern Ontario, streamflow at the index station, Saugeen River near Port Elgin increased, contrary to the normal seasonal pattern of decreasing flow in January, and remained in the normal range for the 4th consecutive month.

In Michigan, monthly mean flows at all index stations remained in the normal range and all lakes and rivers were generally ice covered. The snow mantle in the Upper Peninsula was above normal with heavy accumulations occurring in the western part and along the Lake Superior shoreline. Subzero temperatures prevailed throughout the State during the early part of the month.

In Ohio, streamflow increased seasonally at all index stations and remained above the normal range in Little Beaver Creek near East Liverpool, in the northeastern part of the State, for the 8th time in the past 9 months. Elsewhere in the State, flows were generally above median but within the normal range. Contents of reservoirs in Ohio near monthend were 12 percent greater than a year ago in the Mahoning River basin upstream from Newton Falls, and the same as a year ago in the Scioto River basin upstream from Higby.

In Indiana, monthly mean flows continued to increase seasonally at all index stations as a result of precipitation totals that were generally above normal. Some minor flooding occurred along the lower Wabash and White Rivers due to moderately high flow and ice jams. In southeastern Indiana, monthly mean flow of East Fork White River at Shoals continued to increase, was 3 times the monthly median, and remained in the above-normal range for the 7th consecutive month. (See graph.)



Monthly mean discharge of East Fork White River at Shoals, Ind. (Drainage area, 4,927 sq mi; 12,761 sq km)

In southern Illinois, mean flow of Skillet Fork at Wayne City increased as a result of runoff from heavy rains early in the month and was above the normal range for the first time since May 1978. Elsewhere in the State, mean flows were generally below median at index stations but within the normal range.

Ground-water levels in shallow water-table wells in Minnesota declined and continued below average. Artesian levels in the Minneapolis-St. Paul area continued to rise slightly in the two principal aquifers and were above average. Levels in Wisconsin declined seasonally statewide and were average or above average. In Michigan, levels rose in parts of the southern Lower Peninsula but generally declined elsewhere; they were near to above average in most areas. In Illinois, the level in the shallow index well in glacial drift at Princeton, in Bureau County, declined but continued more than 3 feet above average. Levels in Indiana rose statewide and were generally well above average at month's end. In Ohio, levels rose slightly and continued above average.

MIDCONTINENT

[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

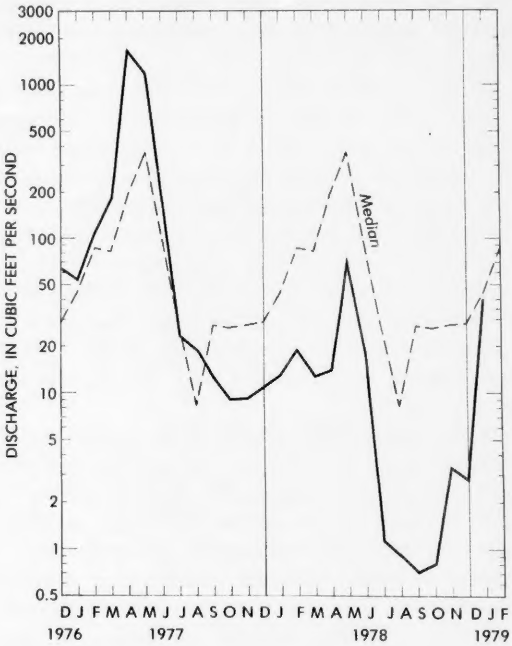
Streamflow decreased in Saskatchewan and Manitoba, and in the northern and central States of the region, but generally increased seasonally in the southern States. Monthly mean flows remained in the above-normal range in parts of Arkansas and North Dakota, and increased into that range in parts of Louisiana and Texas. Mean flows remained in the below-normal range in parts of Kansas and Nebraska. Flooding occurred in parts of Louisiana. Heavy ice cover on many streams, and above-normal snowpack in some basins, in the northern and central States, represents the potential for flooding from ice jams and snowmelt runoff in the event of a sudden thaw.

Ground-water levels declined in North Dakota, and declined but were above average in Iowa. They generally rose but were slightly below average in Nebraska, and rose or held steady but were below average in Kansas and Arkansas. There were mixed trends in Louisiana and Texas. New January low levels were recorded in Kansas, Arkansas, and Louisiana. In Texas, two new January low levels were reached, and a new alltime low occurred in the panhandle.

In northwestern Louisiana, the monthly mean discharge of 884 cfs in Saline Bayou near Lucky (drainage area, 154 square miles) was 4th highest for January since records began in June 1940 and was 6 times the median flow for the month. The cumulative runoff during the first 4 months of the 1979 water year at this station was 2½ times the median for that period. Also in the northwestern part of the State, mean flow of Paw Paw Bayou near Greenwood increased sharply and was 17 times the January median. In north-central Louisiana, flooding occurred along Bayou Macon and the peak discharge of 9,500 cfs on the 21st (gage height, 22.87 feet) at the gaging station near Delhi was equivalent to that of a 25-year flood. In the central part of the State, mean flow of Big Creek at Pollock also increased sharply and was 6 times median. In west-central Louisiana, where monthly mean discharge of Calcasieu River near Oberlin was below the normal range during 8 of the past 10 months, mean flow increased from 23 percent of median in December to 182 percent of median in January and was above the normal range for the first time since December 1977. Mean flow of Red River at Alexandria was 214 percent of median and was in the above-normal range for the first time since April 1977. Mean flow of Mississippi River at Baton Rouge also was in the above-normal range. In Pearl River basin, which drains part of southeastern Mississippi and the adjacent area of Louisiana, the mean flow of the main stem as measured near Bogalusa, La. (drainage area, 6,630 square miles) was 324 percent of median and in the above-normal range. The daily mean discharge of 63,500 cfs on January 30 and 31 was only 100 cfs less than the record-high daily mean for the month, observed in January 1962. Records began at this station in October 1938.

In south-central Arkansas, mean flow of Saline River near Rye continued to increase seasonally, remained in the above-normal range, and was 3½ times the January median discharge. In the north-central part of the State, monthly mean discharge of Buffalo River near St. Joe also continued to increase seasonally but was in the normal range and 1½ times median.

In eastern Texas, mean flow of Neches River near Rockland increased sharply, as a result of runoff from rains near monthend, and was 186 percent of median but remained in the normal range. Cumulative runoff during the first 4 months of the 1979 water year at this station was only 34 percent of median. Also in eastern Texas, monthly mean discharge of North Bosque River near Clifton also increased sharply and was in the normal range, after 7 consecutive months of mean flow in the below-normal range. (See graph.) Cumulative runoff at



Monthly mean discharge of North Bosque River near Clifton, Tex. (Drainage area, 968 sq mi; 2,507 sq km)

this station during the first 4 months of the 1979 water year was only 23 percent of median. In central Texas, mean flow of Guadalupe River near Spring Branch increased sharply, as a result of runoff from rains January 1, was 5 times the median flow for January, and was above the normal range for the 5th time in the past 6 months. Cumulative runoff at this station during the 4-month period, October 1978 through January 1979, was 346 percent of median. Mean flows in the Canadian River basin, and in parts of the Brazos and Red River basins, were reported to be in the below-normal range, while those in the upper Brazos and San Antonio River basins were in the above-normal range.

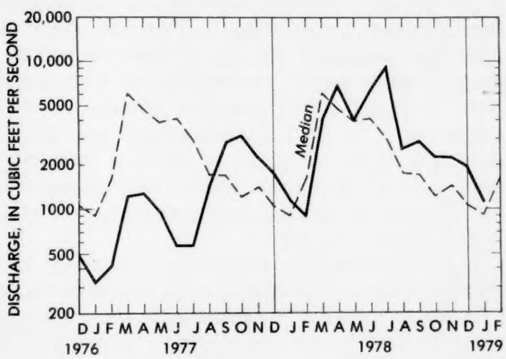
In south-central Oklahoma, monthly mean flow of Washita River near Durwood increased seasonally and was less than median but was in the normal range, after

5 consecutive months of flow in the below-normal range. Cumulative runoff at this station for the first 4 months of the 1979 water year was only 28 percent of median. Elsewhere in the State, flows were reported to be less than median.

In northwestern Kansas, where record-low discharges occurred at the index station, Saline River near Russell, in September, October, November, and December, 1978, mean flow in January was the same as in December and was greater than the minimum January mean of record, but was below the normal range for the 6th time in the past 7 months and was only 18 percent of the January median.

In northwestern Missouri, mean discharge of Grand River near Gallatin decreased, contrary to the normal seasonal pattern of increasing flow, and was in the normal range again after 2 consecutive months of mean flow in the above-normal range. In the south-central part of the State, mean flow of Gasconade River at Jerome also decreased, contrary to the normal seasonal pattern, but remained within the normal range for the 10th consecutive month.

In southwestern Iowa, monthly mean discharge of Nishnabotna River above Hamburg decreased and was in the normal range, after 4 consecutive months of mean flow in the above-normal range at this station. In the eastern part of the State, mean discharge of Cedar River at Cedar Rapids continued to decrease seasonally and was in the normal range, after being above the normal range in December. (See graph.) In the northwestern



Monthly mean discharge of Cedar River at Cedar Rapids, Iowa (Drainage area, 6,510 sq mi; 16,861 sq km)

part of the State, mean flow of Des Moines River at Fort Dodge also decreased seasonally, and was less than median for the first time since June 1978, but was within the normal range.

In southwestern Nebraska, monthly mean flows of unregulated streams in the Republican River basin were reported to be between about 20 percent and 70 percent of normal for the month. Reservoirs on the regulated streams in that basin were reported to be filling slowly. In the panhandle area of northwestern Nebraska, mean flow of Niobrara River above Box Butte Reservoir decreased seasonally, remained below the normal range for the 3d consecutive month, and was only 59 percent of median. The sandhills and panhandle of northwestern Nebraska were designated as a disaster area during the month because of heavy accumulation of snow and extremely low temperatures which made cattle feeding very difficult and caused losses in many herds. In the eastern part of the State, monthly mean discharge of Elkhorn River at Waterloo also decreased seasonally, and was below the normal range for the 6th time in the past 7 months. Flows in north-central Nebraska were reported to be within the normal range.

In central South Dakota, no flow occurred during January in Bad River near Fort Pierre. This was the 4th consecutive month with no observed flow at this site. In the eastern part of the State, mean flow of Big Sioux River, as measured at Akron, Iowa, continued to decrease seasonally, but remained within the normal range for the 9th consecutive month.

In southwestern North Dakota, monthly mean discharge of Cannonball River at Breien also continued to decrease seasonally but was 6 times the January median and remained in the above-normal range for the 7th consecutive month as a result of high carryover flow from December. Cumulative runoff during the first 4 months of the 1979 water year was 302 percent of median at Breien. In the eastern part of the State, mean flow of Red River of the North at Grand Forks continued to decrease seasonally and remained below the normal range for the 5th consecutive month.

In southeastern Saskatchewan, monthly mean flow of Qu'Appelle River near Lumsden continued to decrease seasonally, remained in the normal range for the 6th consecutive month, and also continued to be less than median.

In southern Manitoba, monthly mean discharge of Waterhen River below Waterhen Lake continued to decrease seasonally, was about one-half the January median flow, and was within the normal range for the 28th consecutive month. The level of Lake Winnipeg at Gimli averaged 714.03 feet above mean sea level for the month, 0.06 foot lower than last month, 1.57 feet higher than last January, 0.99 foot higher than the long-term average for January, and 2.02 feet lower than the maximum January mean for the period of record that began in May 1913 at Winnipeg Beach.

Ground-water levels in North Dakota continued their seasonal decline. In Nebraska, levels rose statewide except locally where there was heavy pumping for

municipal supplies. Levels were slightly below average in most parts of the State. In Kansas, levels in the west rose slightly but continued at or near record lows; a new January low was recorded at Colby in the northwest in 32 years of record at the key well. Levels in eastern Kansas held fairly steady. In the rice-growing area of east-central Arkansas, levels rose slightly in the shallow aquifer, and rose more than 4 feet in the deep Sparta Sand aquifer but was 22 feet below average, with a new January low level in 12 years of record. In the industrial area of central and southern Arkansas, the level in the key well in the Sparta Sand at Pine Bluff rose slightly but was nearly 19 feet below average. The level in the key well at El Dorado—also in the Sparta Sand—held fairly steady but continued more than 18 feet below average. In Louisiana, levels in most observation wells in the Sparta and Miocene aquifers in the north continued to decline with several new January lows. Levels in wells in most other aquifers began or continued seasonal rises. Levels in wells in most aquifers of the southeast rose seasonally. However, levels declined in some wells in deep sands in the Florida parishes, and also declined in the "2,000-foot sand" in the Baton Rouge industrial area. Levels in wells in the Chicot aquifer of the southwest rose ½ to 2 feet. Levels in four key wells in the rice-growing area have risen an average of 26 feet since the seasonal lows of July-August 1978, and levels in wells in the Lake Charles industrial area have risen 10–12 feet. In Texas, levels rose and were above average in the Edwards aquifer at Austin and San Antonio. They declined and were below average, with new January lows, in the Evangeline aquifer at Houston and in the bolson deposits at El Paso. A new alltime low was reached in the Ogallala Formation at Plainview in the Texas Panhandle.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

Streamflow decreased in Alberta, British Columbia, Washington, and Wyoming, increased in California and Nevada, and was variable elsewhere in the region. Monthly mean discharge remained in the below-normal range in parts of Colorado, Idaho, Montana, Oregon, Utah, and Washington, and decreased into that range in parts of British Columbia. Mean flows remained in the above-normal range in parts of Alberta, Arizona, New Mexico, Utah, and Wyoming, and increased into that range in parts of California and Nevada. Mean discharges were highest of record for January in parts of Arizona and Utah. Flooding occurred in Nevada.

Ground-water levels declined slightly and were below average in Washington, and declined and were below average in Idaho. Although rising levels prevailed, trends were mixed in other States in the region, and were mixed with respect to average except in New Mexico, where levels were below average. New low levels for January were recorded in Idaho, Montana, Nevada, Arizona, and New Mexico.

In Arizona, where severe flooding and record-high mean discharges occurred throughout the State in December, monthly mean flows remained in the above normal range at all index stations and were highest of record again in some areas. For example, in the extreme southeastern part of the State, the monthly mean discharge of 454 cfs, and the daily mean of 6,420 cfs on the 18th, in San Pedro River at Charleston (drainage area, 1,219 square miles) were highest for the month in 68 years of record. That monthly mean discharge was 26 times the median flow for January, and the cumulative runoff at Charleston for the first 4 months of the 1979 water year, October 1978 through January 1979, was 15 times the median runoff for that period. Also in southeastern Arizona, mean flow of Gila River at head of Safford Valley, near Solomon remained in the above-normal range and was 18 times median for the month. In the north-eastern part of the State, mean flow of Little Colorado River near Cameron remained above the normal range and was 30 times the January median. Cumulative runoff at that station during the period October 1978 through January 1979 was 22 times median.

In southwestern New Mexico, where monthly and daily mean flows of Gila River near Gila were highest of record for the month in December, monthly mean discharge decreased from 18 times median in December to 10 times median in January, and remained in the above-normal range, as a result of high carryover flow from December augmented by increased runoff from rains near midmonth. In the southeastern part of the State, monthly mean flow of Delaware River near Red Bluff continued to decrease but remained above the normal range for the 5th consecutive month and was 3 times the January median. In northern New Mexico, mean flow of Rio Grande below Taos Junction Bridge, near Taos was unchanged from December and remained in the below-normal range.

In central Colorado, east of the Continental Divide, monthly mean flow of Bear Creek at Morrison continued to decrease seasonally and remained in the below-normal range for the 8th consecutive month. During 5 of those months, mean discharges were lowest of record. Cumulative runoff for the first 4 months of the 1979 water year was only 47 percent of median at Morrison. West of the Divide, mean flow of Roaring Fork River at Glenwood Springs also continued to decrease seasonally and was below the normal range. Elsewhere in the State, mean flows were slightly greater than median and were in the normal range.

In southern Wyoming, monthly mean discharge of North Platte River above Seminoe Reservoir, near

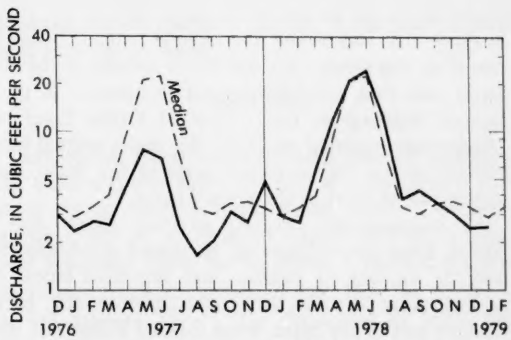
Sinclair continued to decrease seasonally, was 115 percent of median, and remained in the normal range for the 6th consecutive month. In the northern part of the State, mean flow of Tongue River near Dayton also decreased seasonally but remained in the above-normal range.

In the Colorado River basin of eastern Utah and the adjacent area of western Colorado, mean flow of Colorado River near Cisco, Utah (drainage area, 24,100 square miles) increased, contrary to the normal seasonal pattern of decreasing flow, and remained in the above-normal range. The monthly mean discharge of 4,568 cfs and the daily mean of 6,500 cfs on January 26 were highest for the month in 68 years of record. In the northeastern part of the State, mean flow of Whiterocks River near Whiterocks decreased seasonally, remained below the normal range for the 4th consecutive month, and was less than median for the 38th time in the past 40 months. Also in northeastern Utah, monthly mean discharge of Green River at Green River increased, contrary to the normal seasonal pattern, but was in the below-normal range for the 3d time in the past 4 months, and was less than median for the 5th consecutive month. Elsewhere in the State, mean flows decreased seasonally, were in the normal range, and were near or slightly greater than the January median flows.

In northeastern Nevada, flow of Humboldt River at Palisade (drainage area, 5,010 square miles) increased sharply near midmonth as a result of runoff from rain and snowmelt, and the monthly mean discharge of 578 cfs was only 8 percent less than the maximum mean flow for January, in 79 years of record, and was 5 times the January median flow. Similarly, the daily mean discharge of 2,700 cfs on the 13th was only 3 percent less than the maximum daily mean for January, which occurred in 1914. In extreme western Nevada, minor flooding occurred in the Carson City area on January 11 as a result of runoff from rain and snowmelt.

In northern Idaho, monthly mean discharge of Clearwater River at Spalding decreased seasonally, was only 40 percent of median, and remained in the below-normal range for the 4th consecutive month. Cumulative runoff at this station for the first 4 months of the 1979 water year was only 48 percent of median. Mean flows of Coeur d'Alene River, in northern Idaho, and Weiser River, in southwestern Idaho, also were reported to be below the normal range. In other parts of the State, monthly mean discharges were in the normal range and were near median.

In northwestern Montana, west of the Continental Divide, monthly mean flow of Clark Fork at St. Regis increased, contrary to the normal seasonal pattern of decreasing flow, but remained in the below-normal range for the 3d consecutive month. (See graph.) Also west of the Divide, mean discharge of Middle Fork Flathead River near West Glacier increased, contrary to the normal pattern of decreasing flow, and was only 74



Monthly mean discharge of Clark Fort at St. Regis, Mont. (Drainage area, 10,709 sq mi; 27,736 sq km)

percent of median but was within the normal range. East of the Divide, and also in the northwestern part of the State, mean flow of Marias River near Shelby decreased sharply and was below the normal range. In the southern part of the State, and also east of the Divide, mean flows of Yellowstone River at Corwin Springs, and downstream at Billings, decreased seasonally and were in the normal range.

In southwestern Alberta, monthly mean flow of Bow River at Banff continued to decrease seasonally but remained in the above-normal range for the 5th consecutive month as a result of high carryover flow from December, augmented by increased runoff during the first week of the month. In the western part of the Province, mean flow of Athabasca River at Hinton continued to decrease seasonally but was in the normal range and was greater than median for the 5th consecutive month.

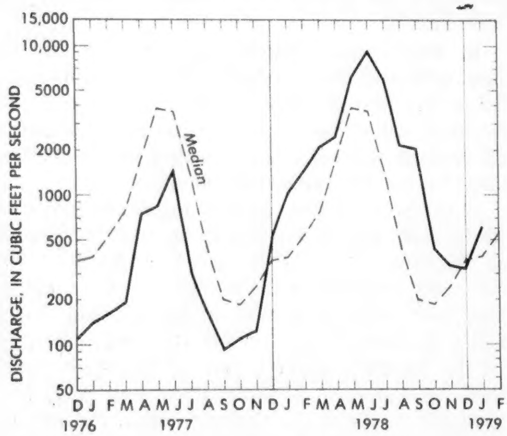
In northwestern British Columbia, monthly mean flow of Skeena River at Usk decreased sharply and was below the normal range. In the southern part of the Province, mean flow of Fraser River at Hope continued to decrease seasonally and remained within the normal range for the 7th consecutive month.

In the Spokane River basin of eastern Washington and the adjacent area of northern Idaho, monthly mean flow of Spokane River, as measured at Spokane, Wash., decreased, contrary to the normal pattern of increasing flow, was only 32 percent of median, and remained below the normal range for the 4th consecutive month. In the extreme southern part of the State, monthly mean discharge of Klickitat River near Pitt, on the southeast slopes of the Cascade Range, also was below the normal range for the month. In northwestern Washington, on the western slope of the Cascades, monthly mean flow of Skykomish River near Gold Bar decreased seasonally, was only 34 percent of median, and remained below the normal range. In the southwestern part of the State, mean discharge of Chehalis River near Grand Mound also decreased, but contrary to the normal seasonal pattern, was only 25 percent of

median, and was below the normal range. Cumulative runoff at this station for the first 4 months of the 1979 water year was only 48 percent of median. In northeastern Washington, mean flow of Kettle River near Laurier was reported to be in the above-normal range, and in central and northern parts of the State, flows were reported to be in the normal range.

In north-coastal Oregon, monthly mean flow in Wilson River near Tillamook decreased seasonally, was only 31 percent of median, and remained below the normal range for the 4th consecutive month. In the western part of the State, mean flow of Willamette River at Salem decreased sharply, contrary to the normal seasonal pattern of increasing flow, was only 37 percent of median, and was in the below-normal range. Similarly, in northeastern Oregon, monthly mean discharge of John Day River at Service Creek decreased sharply, also contrary to the normal seasonal pattern of increasing flow, was only 33 percent of the January median flow, and was below the normal range. Elsewhere in the State, flows were in the normal range.

In south-coastal California, monthly mean flow of Arroyo Seco near Pasadena continued to increase seasonally, was 317 percent of median, and was in the above-normal range for the 13th time in the past 14 months. Landslides were reported to have resulted from the heavy precipitation in this part of the State. In the southern Sierra Nevada west slope, mean flow of Kings River above North Fork, near Trimmer, increased seasonally, was 1½ times the January median, but was in the normal range. (See graph.) Cumulative runoff at this



Monthly mean discharge of Kings River above North Fork, near Trimmer, Calif. (Drainage area 952 sq mi; 2,466 sq km)

station for the first 4 months of the 1979 water year was 120 percent of median. In northern California, on the central Sierra Nevada west slope, where mean flow of North Fork American River at North Fork Dam was below the normal range in November and December, monthly mean discharge increased sharply, as a result of runoff from rains during the second week of the month, and was in the normal range. Cumulative runoff there for the first 4 months of the 1979 water year was only 59 percent of median. In north-coastal California, where monthly mean discharge of Smith River near Crescent City also was below the normal range in November and December, mean flow increased seasonally and was in the normal range, but was only 51 percent of the median discharge for January. Cumulative runoff at this station for the first 4 months of the 1979 water year was only 37 percent of median. Monthend snowpack in the northern and central Sierra Nevada was reported to be approximately equivalent to that of the long-term average.

Contents of the Colorado River Storage Project decreased 619,160 acre-feet during the month.

Ground-water levels in Washington changed little—declining only slightly—and continued below average. In Idaho, the level in the index well in the sand and gravel aquifer in the Boise Valley declined nearly a foot and was half a foot below average. Levels in key wells representative of the Snake River plain aquifer declined in the western part, and declined and reached new lows for January in the eastern, south-central, and southwestern parts; all continued below average. In Montana, the level declined and was below average in the Stahl well at Missoula. The level in the Hamilton Fairgrounds well declined, was below average, and reached a new low for January in 9 years of record. In the Missouri River drainage in the northern part of Montana, levels generally rose and were above average. In southern California, levels in four of the five key wells rose but were mixed with respect to average. Levels in key wells at Baldwin Park and at Alamitos, in Los Angeles and Orange Counties, respectively, rose but continued below average. In Santa Barbara County, levels in key wells in Santa Ynez and Santa Maria Valleys rose and continued above and below average, respectively. The level in the well in the upper Cuyama Valley declined but continued above average. In Nevada, the level in the key well in Las Vegas Valley rose but nevertheless was at a new January low in 33 years of record. Levels in wells in Paradise and Steptoe Valleys rose and continued above average. The level in the well at Truckee Meadows declined and was below average. In Utah, levels generally rose throughout the State except in the Logan area where slight declines were recorded. Levels were below average over much of the State except in the Blanding area where they continued above average. In Arizona, levels declined in one index well and rose in three. A new January low, despite a slight net rise, was recorded in the well in the Elfrida area, in 28 years of record. In New Mexico, levels rose in the Lovington, Hagerman West, and Berrendo-Smith wells, and declined slightly in the Hrna and Dayton wells; all were below average. A new January low was reached in the Dayton well in 41 years of

record. Levels in several wells were significantly above those of a year ago, apparently because of recent above-normal precipitation.

ALASKA

Streamflow decreased seasonally at all index stations in the State and was in the normal range except in the interior basin of glacier-fed Tanana River basin where flows remained in the above-normal range. In southeastern Alaska, monthly mean discharge of Gold Creek at Juneau decreased sharply to only 43 percent of median as a result of below-normal precipitation and below-freezing temperatures but remained in the normal range for the 3d consecutive month. Flows remained above median in the Kenai and Little Susitna River basins in south coastal areas of the State, partly as a result of above-normal temperatures.

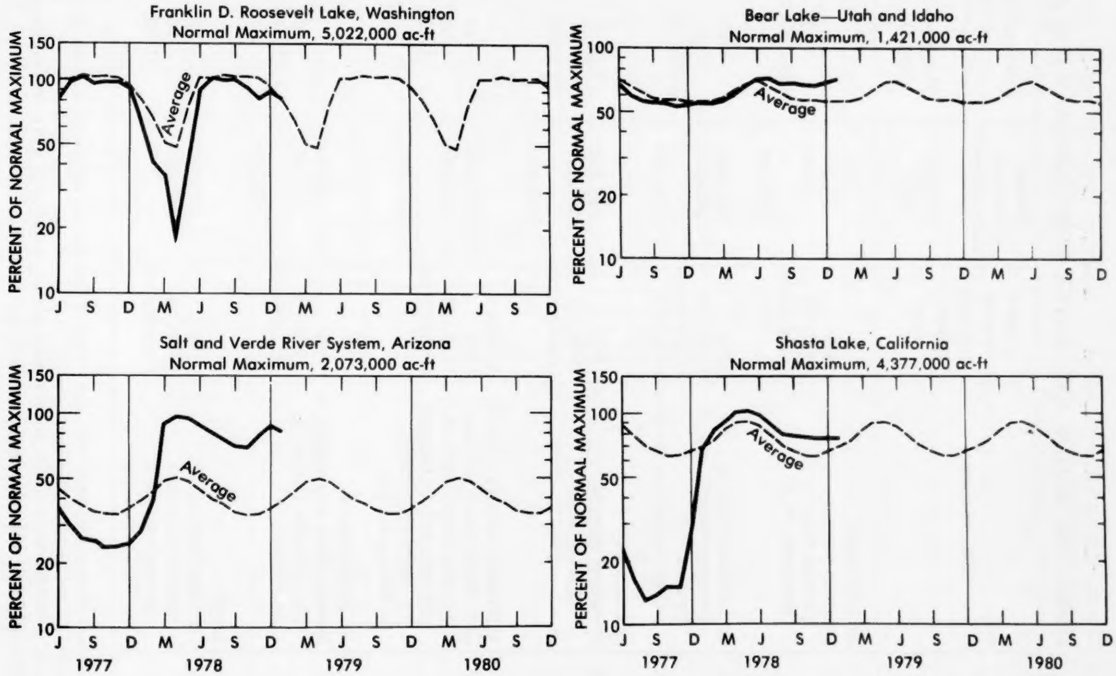
Ground-water levels in wells tapping confined aquifers in the Anchorage area generally rose 1 to 4 feet, except near the Chugach foothills where declines of 1 to 2 feet occurred. Levels declined slightly in the shallow water-table observation wells.

HAWAII

Streamflow increased at all index stations throughout the State and was above the normal range except at the index station on the island of Kauai. Monthly mean flow increased sharply at the index station on Waiakea Stream near Mountain View, on the island of Hawaii, as a result of runoff from 25 inches of rain that fell during the period January 11–15. On the island of Maui, mean flow at Honopou Stream near Huelo increased to nearly 4 times median and remained above the normal range for the 3d consecutive month.

On Guam, monthly mean flow of Ylig River near Yona remained in the normal range at 88 percent of median. Expected heavy rains from Typhoon Alice, which passed over the island on January 10–11, failed to materialize.

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS, JUNE 1977 TO JANUARY 1979



Near- or above-average contents characterized most reservoirs in the West during January. Much above-average contents continued to characterize the Salt and Verde River System in Arizona. (See graph above.)

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR JANUARY AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	January data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean (tons per day)	Minimum (tons per day)	Maximum (tons per day)	Mean, in °C	Minimum, in °C	Maximum, in °C
	NORTHEAST										
01463500	Delaware River at	*1979	37,740	....	....	....	....	....	.....	.....	.....
	Trenton, N.J.	1945–78	13,070	62	201	....	998	20,800	.....	0	7.5
	(Morrisville, Pa.)	(Extreme yr)		(1951, 1960)	(1959)		(1965)	(1976)			
			[c]10,240								
04264331	St. Lawrence River at	1979	221,000	167	168	100,000	90,000	106,000	0.5	0.5	1.0
	Cornwall, Ontario, near	1976–78	240,000	166	168	109,000	90,000	128,000	0.5	0	2.0
	Massena, N.Y.	(Extreme yr)		(1976–78)	(1976, 1977)		(1977)	(1978)			
	median streamflow at Ogdensburg, N.Y.		[c]223,000								
	SOUTHEAST										
07289000	Mississippi River at	1979	922,600	157	185	430,000	410,000	465,000	3.5	2.0	6.5
	Vicksburg, Miss.	1976–78	546,900	161	246	298,000	138,000	501,000	2.0	0	6.5
		(Extreme yr)		(1976)	(1978)		(1977)	(1978)			
			[c]535,400								
	WESTERN GREAT LAKES REGION										
03612500	Ohio River at lock and dam	1979	675,600	143	182	....	172,000	356,000	.....	1.5	5.0
	53, near Grand Chain, Ill.	1955–78	355,300	98	382	....	28,500	448,000	.....	0	10.0
	(25 miles west of Paducah,	(Extreme yr)		(1973)	(1964)		(1956)	(1970)			
	Ky.; streamflow station		[c]315,300								
	at Metropolis, Ill.)										
	MIDCONTINENT										
06934500	Missouri River at Hermann,	*1979	32,100	....	....	....	....	....	.....	.....	.....
	Mo. (60 miles west of St.	1976–78	32,700	159	553	37,300	26,700	53,700	0	0	4.5
	Louis, Mo.)	(Extreme yr)		(1976)	(1977)		(1976)	(1976)			
			[c]32,940								
	WEST										
14128910	Columbia River at	1979	161,000	83	114	47,500	24,300	67,400	0.5	0	1.5
	Warrendale, Oreg.	1976–78	169,200	76	92	40,400	25,400	57,100	5.0	2.0	8.0
	(streamflow station	(Extreme yr)		(1978)	(1976)		(1978)	(1976)			
	at The Dalles, Oreg.)		[c]112,300								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: $[(1.8 \times °C) + 32] = °F$.
[c]Median of monthly values for 30-year reference period, water years 1941–70, for comparison with data for current month.
*Dissolved-solids and water-temperature records not available.

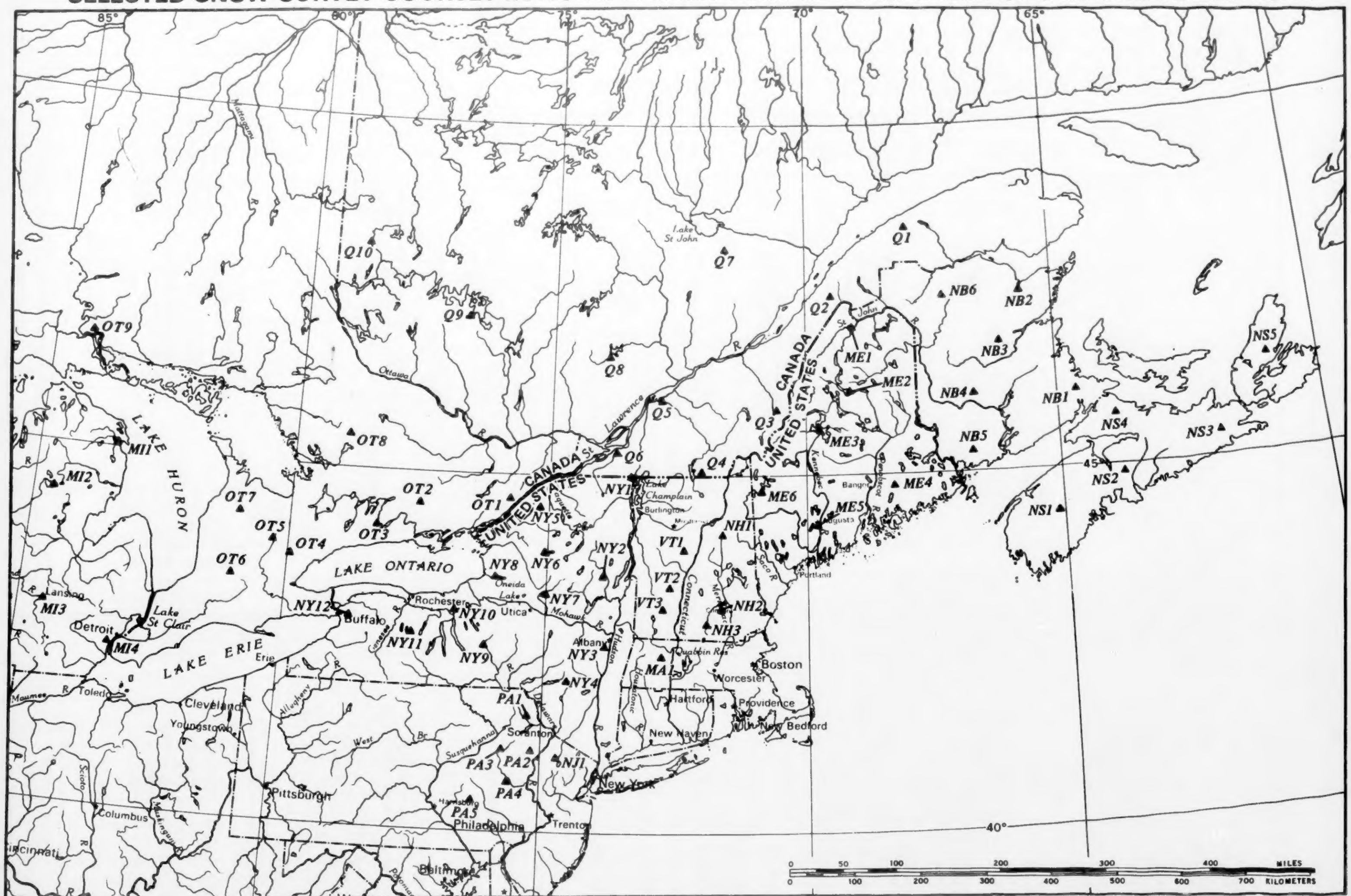
USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JANUARY 1979

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of Dec. 1978	End of Jan. 1979	End of Jan. 1978	Average for end of Jan.	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	27	49	94	156	226,300 (a)
QUEBEC					
Allard (P)	64	53	62	43	280,600 ac-ft
Gouin (P)	57	51	68	55	6,954,000 ac-ft
MAINE					
Seven reservoir systems (MP)	34	41	86	50	178,500 mcf
NEW HAMPSHIRE					
First Connecticut Lake (P)	21	26	b3	36	3,330 mcf
Lake Francis (FPR)	71	62	63	51	4,326 mcf
Lake Winnipesaukee (PR)	46	62	78	57	7,220 mcf
VERMONT					
Harriman (P)	24	21	62	46	5,060 mcf
Somerset (P)	72	78	59	59	2,500 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	62	74	79	70	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	37	47	57	44	34,270 mcf
Indian Lake (FMP)	60	48	77	53	4,500 mcf
New York City reservoir system (MW)	61	84	99	......	547,500 mg
NEW JERSEY					
Wanaque (M)	41	92	102	77	27,730 mg
PENNSYLVANIA					
Allegheny (FPR)	28	12	12	24	51,400 mcf
Pymatuning (FMR)	87	94	96	83	8,191 mcf
Raystown Lake (FR)	68	69	61	44	33,190 mcf
Lake Wallenpaupack (PR)	58	65	74	52	6,875 mcf
MARYLAND					
Baltimore municipal system (M)	86	98	89	87	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	75	82	93	78	12,580 mcf
Narrows (Badin Lake) (P)	99	100	100	96	5,616 mcf
High Rock Lake (P)	50	96	100	69	10,230 mcf
SOUTH CAROLINA					
Lake Murray (P)	79	82	86	63	70,300 mcf
Lakes Marion and Moultrie (P)	62	69	84	68	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	45	53	93	59	75,360 mcf
GEORGIA					
Burton (PR)	69	74	82	56	104,000 ac-ft
Sinclair (MPR)	76	75	96	80	214,000 ac-ft
Lake Sidney Lanier (FMPR)	39	47	67	54	1,686,000 ac-ft
ALABAMA					
Lake Martin (P)	72	72	89	67	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	34	52	46	33	1,156,000 cfsd
Douglas Lake (FPR)	13	17	29	13	703,100 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	40	50	52	42	510,300 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	39	47	39	32	1,452,000 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	43	55	53	39	745,200 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	72	54	57	42	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	59	40	49	33	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	25	21	20	21	1,640,000 ac-ft
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	84	80	69	......	22,700,000 ac-ft
SOUTH DAKOTA					
Angostura (I)	93	95	53	73	127,600 ac-ft
Bell Fourche (I)	61	66	46	48	185,200 ac-ft
Lake Francis Case (FIP)	58	65	69	65	4,834,000 ac-ft
Lake Oahe (FIP)	81	83	71	......	22,530,000 ac-ft
MIDCONTINENT REGION--Continued					
SOUTH DAKOTA--Continued					
Lake Sharpe (FIP)	102	102	103	96	1,725,000 ac-ft
Lewis and Clarke Lake (FIP)	90	93	93	93	477,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	63	64	68	71	1,948,000 ac-ft
OKLAHOMA					
Eufaula (FPR)	76	78	82	82	2,378,000 ac-ft
Keystone (FPR)	77	83	84	87	661,000 ac-ft
Tenkiller Ferry (FPR)	88	88	94	88	628,200 ac-ft
Lake Altus (FIMR)	44	45	71	49	134,600 ac-ft
Lake O'The Cherokees (FPR)	72	80	85	78	1,492,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	81	81	80	87	2,722,000 ac-ft
TEXAS					
Bridgeport (IMW)	33	34	64	43	386,400 ac-ft
Canyon (FMR)	99	102	92	71	385,600 ac-ft
International Amistad (FIMPW)	111	111	95	80	3,497,000 ac-ft
International Falcon (FIMPW)	100	100	84	75	2,668,000 ac-ft
Livingston (IMW)	88	100	100	77	1,788,000 ac-ft
Possum Kingdom (IMPRW)	93	92	81	96	569,400 ac-ft
Red Bluff (PI)	33	33	7	31	307,000 ac-ft
Toledo Bend (P)	89	102	87	80	4,472,000 ac-ft
Twin Buttes (FIM)	62	63	78	28	177,800 ac-ft
Lake Kemp (IMW)	57	58	60	87	268,000 ac-ft
Lake Meredith (FMW)	34	33	36	38	821,300 ac-ft
Lake Travis (FIMPRW)	72	78	75	79	1,144,000 ac-ft
THE WEST					
WASHINGTON					
Ross (PR)	67	37	60	53	1,052,000 ac-ft
Franklin D. Roosevelt Lake (IP)	89	83	60	81	5,022,000 ac-ft
Lake Chelan (PR)	58	42	43	44	676,100 ac-ft
Lake Cushman	65	55	79	83	359,500 ac-ft
Lake Merwin (P)	101	98	97	96	245,600 ac-ft
IDAHO					
Boise River (4 reservoirs) (FIP)	64	67	34	63	1,235,000 ac-ft
Coeur d'Alene Lake (P)	31	12	70	50	238,500 ac-ft
Pend Oreille Lake (FP)	35	36	35	54	1,561,000 ac-ft
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	76	76	45	66	4,401,000 ac-ft
WYOMING					
Boysen (FIP)	77	73	68	69	802,000 ac-ft
Buffalo Bill (IP)	64	56	47	64	421,300 ac-ft
Keyhole (F)	78	78	56	41	199,900 ac-ft
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	51	49	41	45	3,056,000 ac-ft
COLORADO					
John Martin (FIR)	0	1	1	15	364,400 ac-ft
Taylor Park (IR)	56	57	33	54	106,200 ac-ft
Colorado–Big Thompson project (I)	41	41	22	55	722,600 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	65	63	58	......	31,620,000 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	69	71	55	56	1,421,000 ac-ft
CALIFORNIA					
Folsom (FIP)	64	66	60	52	1,000,000 ac-ft
Hetch Hetchy (MP)	56	48	25	30	360,400 ac-ft
Isabella (FIR)	43	43	12	22	570,000 ac-ft
Pine Flat (FI)	66	70	28	49	1,001,000 ac-ft
Clair Engle Lake (Lewiston) (P)	64	63	33	76	2,438,000 ac-ft
Lake Almanor (P)	76	71	60	47	1,036,000 ac-ft
Lake Berryessa (FIMW)	68	71	66	82	1,600,000 ac-ft
Millerton Lake (FI)	64	88	70	64	503,200 ac-ft
Shasta Lake (FIPR)	76	76	66	70	4,377,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	8	12	5	51	744,600 ac-ft
NEVADA					
Rye Patch (I)	23	25	23	58	194,300 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	84	87	75	66	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	45	75	2	15	1,073,000 ac-ft
Salt and Verde River system (IMPR)	89	82	28	39	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	26	26	30	77	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	9	10	9	28	2,539,000 ac-ft

[a]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).
[b]Reservoir drawn down for repairs.

SELECTED SNOW SURVEY COURSES IN NORTHEASTERN UNITED STATES AND SOUTHEASTERN CANADA



Provisional data; subject to revision

SNOW SURVEY DATA

Map number	Snow course	River basin	Location: Elev. above MSL	Location: Latitude	Location: Longitude	This season: Date of survey	This season: Snow depth (inches)	This season: Water content (inches)	Past seasons, Water content: End of January average	Past seasons, Water content: Years of record	Agency providing data*
NS1	Caledonia	Medway	300	44°25′	65°03′	1/31	0	0			WSC
NS2	Mount Uniacke		500	44°53′	63°50′	1/31	0	0			...do ....
NS3	Copper Lake	South	320	45°23′	61°57′	1/31	0	0			...do ....
NS4	Oxford	Philip	120	45°43′	63°51′	1/31	0	0			...do ....
NS5	Margaree Valley	Northeast Margaree	150	46°21′	60°58′	1/31	0	0			...do ....
NB1	Moncton	Petitcodiac	150	46°04′	64°36′	1/4	1.0	0.5	3.4	16	...do ....
NB2	Pabineau Falls	Nipisiguit	100	47°30′	65°41′	1/17	22.9	5.6	4.9	16	...do ....
NB3	Renous	Miramichi	75	46°56′	65°55′	1/19	24.5	4.8	4.4	9	...do ....
NB4	Royal Road	N. Nashwaaksis	427	46°04′	66°43′				4.0	11	NBDOE
NB5	Elmcroft	Magaguadavic	300	45°16′	66°49′	1/24	3.2	1.4	2.3	16	WSC
NB6	St. Quentin No. 1	Restigouche	1,200	47°30′	67°15′				5.4	16	NBEPC
Q1	St-Moise	Mitis	775	48°31′	67°59′	1/27	35.9	11.0	7.2	18	QMS
Q2	Pelletier	Du Loup	1,200	47°34′	69°27′	1/27	37.9	10.8	6.6	19	...do ....
Q3	St-Theophile	Chaudiere	1,450	45°56′	70°31′	1/30	27.5	7.2	3.8	20	...do ....
Q4	Stanstead	St-Francois	1,250	45°03′	72°04′	1/31	34.2	8.2	4.6	22	...do ....
Q5	Pierreville	...do	75	46°04′	72°48′	1/29	29.0	7.3	5.1	21	...do ....
Q6	Mercier	Chateauguay	180	45°19′	73°45′	1/30	21.6	5.7	4.9	6	...do ....
Q7	Rivere Aux Ecorces	Reservoir Kenogami	1,400	48°11′	71°38′	1/29	36.6	10.9	5.8	18	...do ....
Q8	St-Michel-Des Saints	St-Maurice	1,300	46°42′	73°53′	1/29	24.9	5.2	4.6	12	...do ....
Q9	Rapide	Gatineau	1,300	47°13′	76°43′	1/29	37.5	8.6	5.7	1	...do ....
Q10	McWatters	Outaouais	960	48°13′	78°55′	1/30	31.6	6.6	4.7	23	...do ....
OT1	Brockville	Buell Creek	350	44°38′	75°43′	2/1	15.7	3.6	3.5	8	WSC
OT2	Madoc	Moira	650	44°31′	77°31′	2/1	20.8	7.2	3.5	20	...do ....
OT3	Squirrel Creek	Trent	625	44°11′	78°20′	2/1	23.3	3.5	2.6	7	...do ....
OT4	Terra Cotta	Credit	1,125	43°43′	79°57′	2/1	15.3	4.3	2.5	16	...do ....
OT5	Waldemar	Grand	1,490	43°54′	80°17′	2/1	19.7	6.5	3.0	18	...do ....
OT6	Sebringville	Thames	1,190	43°24′	81°01′	2/1	19.4	6.2	2.2	22	...do ....
OT7	Chesley	Saugeen	975	44°17′	81°02′	2/1	20.6	6.6	3.1	9	...do ....
OT8	Kiwanis	Muskoka	1,300	45°27′	78°58′	2/1	33.7	6.6	4.1	14	...do ....
OT9	Wishart	Root	725	46°34′	84°17′	2/1	27.4	6.4	7.3	6	...do ....
ME1	Alagash "B"	St. John	640	47°05′	69°04′	1/31	24.8	8.0			USGS
ME2	Telos	Penobscot	1,000	46°09′	69°07′	1/30	30.0	6.0			BHEC
ME3	Moosehead	Kennebec	1,040	45°35′	69°43′	1/31	30.2	8.5			KWPC
ME4	Amherst	Coastal	150	44°49′	68°22′	......	....	....			BHEC
ME5	Augusta	Kennebec	160	44°19′	69°45′	1/26	15.8	4.8			USGS
ME6	Middle Dam	Androscoggin	1,430	44°46′	70°55′	1/31	36.0	6.5			UWPC
NH1	Cannon Mt. (Base)	Merrimack	1,950	44°10′	71°41′	2/5	40.8	10.8			CE
NH2	Everett Dam	...do	460	43°05′	71°39′	2/5	20.1	6.9			...do ....
NH3	MacDowell Dam	...do	960	42°54′	71°59′	2/5	24.2	9.6			...do ....
VT1	Vershire	Connecticut	1,920	43°59′	72°22′	2/5	32.6	10.4			...do ....
VT2	Proctorsville Gulf	...do	1,060	43°22′	72°38′	2/5	29.2	8.1			...do ....
VT3	Ball Mt. Dam	...do	1,130	43°06′	72°48′	2/5	29.6	8.6			...do ....
MA1	Lithia Post Office	Connecticut	1,180	42°27′	72°50′	2/5	18.0	6.3			...do ....
NY1	Perry Mills	Lake Champlain	200	44°59′	73°31′	2/5	19.6	5.15	2.61	32	USGS
NY2	Sodom	Hudson	1,400	43°37′	73°59′	2/5	28.1	7.30	4.00	27	NMP-Albany
NY3	Slingerlands	Hudson	230	42°38′	73°53′	2/7	8.4	2.48	1.55	20	USGS
NY4	Margaretville	Delaware	1,340	42°09′	74°38′	2/5	6.0	1.61	1.27	29	...do ....
NY5	Pyrites	St. Lawrence	400	44°32′	75°11′	2/7	19.6	4.46	2.38	32	...do ....
NY6	Stillwater Reservoir	Black	1,700	43°54′	75°03′	2/5	45.5	9.70	4.96	35	BRRD
NY7	Northwood	Mohawk	1,250	43°21′	75°04′	2/6	33.0	8.30	4.59	34	NMP-Utica
NY8	Stillwater Dam	Eastern Oswego	970	43°33′	75°55′	2/5	42.0	11.12	5.11	35	NMP-Syracuse
NY9	Cortland	E. Susquehanna	1,130	42°36′	76°11′	2/5	15.0	....	1.32	25	NWS-Albany
NY10	Clyde (Lock 26)	Western Oswego	392	43°04′	76°50′	2/5	10.5	2.72	1.90	17	DOT-Syracuse
NY11	Canadice and Hemlock Lakes	Genesee	1,800	42°43′	77°35′	2/6	12.6	2.94	1.53	28	DPW-Rochester
NY12	Buffalo Airport	Lake Erie	705	42°56′	78°44′	2/6	20.0	5.7	1.71	10	NWS-Buffalo
NJ1	Newton	Pequest	640	41°01′	74°47′	2/6	1.0	.3			USGS
PA1	Prompton-Jadwin Reservoir	Lackawaxen	1,600	41°36′	75°18′	2/5	9.3	2.4			CE
PA2	Paradise Valley	Brodhead Cr.	840	41°07′	75°16′	2/5	3.8	1.2			USGS
PA3	F. E. Walter Reservoir	Lehigh	1,700	41°07′	75°44′	2/5	10.7	2.1			CE
PA4	Lyon Valley	Jordan Cr.	720	40°40′	75°40′	2/6	1.0	.35			USGS
PA5	Meyerstown	Schuylkill	660	40°24′	76°18′	2/6	1.2	.35			...do ....
MI1	Alpena	Thunder Bay	689	45°04′	83°34′	1/29	21.0	4.0			NWS
MI2	Houghton Lake	Muskegon	1,149	44°22′	84°41′	1/29	23.0	4.2			...do ....
MI3	Lansing	Grand	841	42°47′	84°36′	1/29	14.0	4.1			...do ....
MI4	Detroit	Rouge	633	42°14′	83°20′	1/29	3.0	0.6			...do ....

*Key: WSC – Water Survey of Canada; NBDOE – New Brunswick Department of Environment; NBEPC – New Brunswick Electric Power Commission; QMS – Quebec Meteorological Service; USGS – United States Geological Survey; BHEC – Bangor Hydro Electric Company; KWPC – Kennebec Water Power Company; UWPC – Union Water Power Company; CE – Corps of Engineers; NMP – Niagara Mohawk Power; BRRD – Black River Regulating District; NWS – National Weather Service; DOT – Department of Transportation; DPW – Department of Public Works.

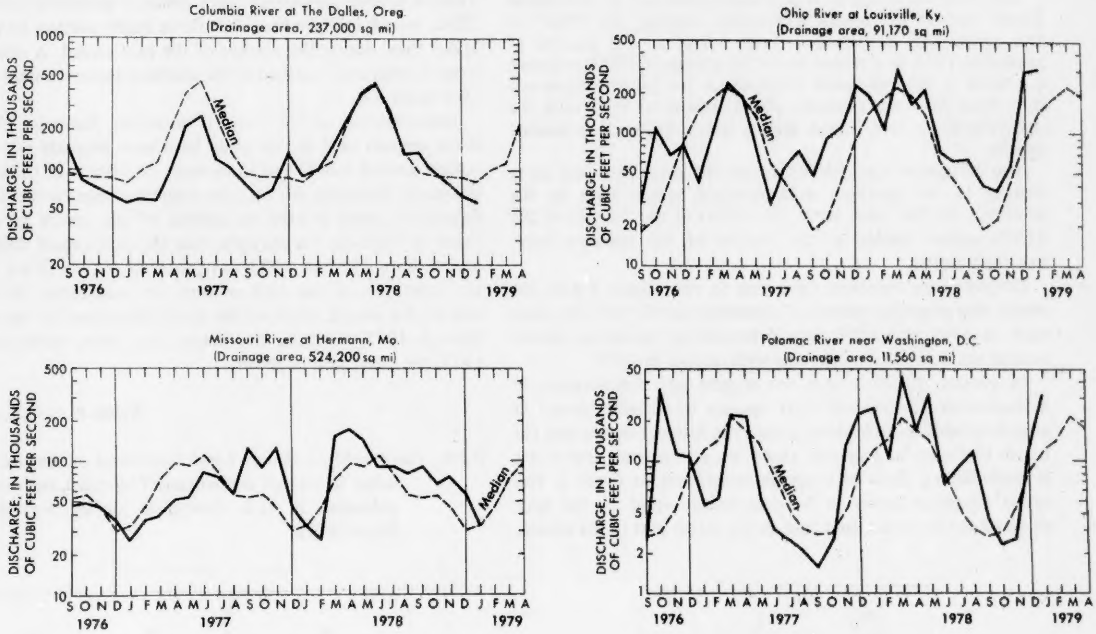
Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING JANUARY 1979

Station number*	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1975 (cfs)	January 1979					
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941–70	Change in discharge from previous month (percent)	Discharge near end of month (cfs)	Discharge near end of month (mgd)	Date
1–0140	St. John River below Fish River at Fort Kent, Maine	5,690	9,549	3,609	128	+94	3,900	2,520	31
1–3185	Hudson River at Hadley, N.Y	1,664	2,853	2,672	151	+78	2,100	1,360	31
1–3575	Mohawk River at Cohoes, N.Y	3,456	5,630	8,074	177	+96	......	......	.....
1–4635	Delaware River at Trenton, N.J	6,780	11,630	34.047	332	+256	30,000	19,000	30
1–5705	Susquehanna River at Harrisburg, Pa	24,100	34,200	89,000	294	+203	239,000	154,000	25
1–6465	Potomac River near Washington, D.C	11,560	[1]11,190	31,850	277	+179	21,100	13,600	31
2–1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C	4,810	5,007	12,000	229	+202	9,200	5,900	31
2–1310	Pee Dee River at Peedee, S.C	8,830	9,657	13,900	139	+126	35,900	23,200	29
2–2260	Altamaha River at Doctortown, Ga	13,600	13,780	9,703	68	+106	16,400	10,600	31
2–3205	Suwannee River at Branford, Fla	7,880	6,970	3,600	86	+55	4,000	2,590	31
2–3580	Apalachicola River at Chattahoochee, Fla	17,200	22,330	14,700	58	+59	15,000	9,700	31
2–4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	22,570	64,050	221	+697	86,000	55,600	31
2–4895	Pearl River near Bogalusa, La	6,630	9,263	26,230	324	+487	63,500	41,000	31
3–0495	Allegheny River at Natrona, Pa	11,410	[1]19,210	33,110	149	+22	11,900	7,690	25
3–0850	Monongahela River at Braddock, Pa	7,337	[1]12,360	35,770	212	-2	45,100	29,100	25
3–1930	Kanawha River at Kanawha Falls, W.Va	8,367	12,530	29,810	191	+81	56,200	36,300	24
3–2345	Scioto River at Higby, Ohio	5,131	4,513	8,054	213	+4	8,300	5,400	26
3–2945	Ohio River at Louisville, Ky[2]	91,170	114,100	310,500	212	+4	417,000	270,000	24
3–3775	Wabash River at Mount Carmel, Ill	28,635	27,030	38,980	176	+22	28,000	18,100	31
3–4690	French Broad River below Douglas Dam, Tenn	4,543	[1]6,794	11,700	147	+134	......	......	.....
4–0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,185	3,954	114	-15	......	......	.....
02MC002 (4–2643.31)	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	241,100	221,400	99	-2	235,000	152,000	31
050115	St. Maurice River at Grand Mere, Quebec	16,300	25,300	6,700	80	-34	20,800	13,400	31
5–0825	Red River of the North at Grand Forks, N. Dak	30,100	2,524	680	88	-8	640	410	31
5–1335	Rainy River at Manitou Rapids, Minn	19,400	12,950	8,050	87	-24	7,800	5,040	25
5–3300	Minnesota River near Jordan, Minn	16,200	3,412	291	60	-25	310	200	23
5–3310	Mississippi River at St. Paul, Minn	36,800	[1]10,580	4,530	101	-13	4,330	2,800	23
5–3655	Chippewa River at Chippewa Falls, Wis	5,600	5,110	2,907	106	-9	......	......	.....
5–4070	Wisconsin River at Muscoda, Wis	10,300	8,613	6,742	120	0	......	......	.....
5–4465	Rock River near Joslin, Ill	9,551	5,852	3,580	104	-28	3,600	2,300	31
5–4745	Mississippi River at Keokuk, Iowa	119,000	62,570	31,309	95	-19	32,400	20,900	31
6–2145	Yellowstone River at Billings, Mont	11,796	6,986	2,552	99	-25	2,250	1,450	31
6–9345	Missouri River at Hermann, Mo	524,200	79,750	32,430	98	-40	37,300	24,100	26
7–2890	Mississippi River at Vicksburg, Miss[4]	1,140,500	573,600	922,600	172	+7	1,000,000	646,000	31
7–3310	Washita River near Durwood, Okla	7,202	1,414	273	60	+69	200	130	31
8–2765	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	724	349	76	0	360	230	31
9–3150	Green River at Green River, Utah	40,600	6,366	1,535	84	+3	3,400	2,200	31
11–4255	Sacramento River at Verona, Calif	21,257	19,150	19,820	77	+72	16,700	10,800	26
13–2690	Snake River at Weiser, Idaho	69,200	18,170	16,510	111	+5	16,000	10,300	28
13–3170	Salmon River at White Bird, Idaho	13,550	11,290	3,890	92	-6	3,600	2,300	28
13–3425	Clearwater River at Spalding, Idaho	9,570	15,570	10,160	154	-16	11,900	7,690	28
14–1057	Columbia River at The Dalles, Oreg[5]	237,000	194,600	58,400	70	-9	......	......	.....
14–1910	Willamette River at Salem, Oreg	7,280	23,810	20,200	37	-43	15,200	9,820	27–31
15–5155	Tanana River at Nenana, Alaska	25,600	23,850	6,890	106	-13	6,600	4,300	31
8MF005	Fraser River at Hope, British Columbia	83,800	96,400	30,900	90	-9	29,900	19,300	30

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.
*The U.S. station numbers as listed in this table are in a shortened form previously in use, and used here for simplicity of tabular and map presentation. The full, correct number contains 8 digits and no punctuation marks. For example, the correct form for station number 1–3185 is 01318500.

HYDROGRAPHS OF FOUR LARGE RIVERS



WATER RESOURCES REVIEW

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for January based on 20 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for January 1979 is compared with flow for January in the 30-year reference period 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for January is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range.* In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the January flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of January. Water level in each key observation well is compared with average level for the end of January determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels,* unless described otherwise, are from the end of December to the end of January.

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The variation in the flow of rivers in that part of the United States west of the Rocky Mountains—termed the "West" in this article (fig. 1)—ranged from a high of 175 percent of normal in 1941 to a record low of 40 percent in 1977, as shown on figure 2. Normal runoff totals about 300 billion gallons per day. River flow was generally above normal for 1910 until the mid-1920's—a wet period during which irrigation expanded rapidly.

The drought of the 1930's affected the entire West, but more sharply in the northern intermountain region than in the southern. On the other hand, the effects of the drought of the 1950's appear mainly in the records of the southern intermountain region.

Despite sharp variations from year to year, figure 2 does not reveal long persistent periods of abnormal runoff. Very dry years such as 1931 and 1961 were followed by normal or above-normal years, as was also the case with respect to 1977.

In general, figure 2 does not suggest any deterioration in surface-water supplies and there appears to be little change in annual variability. In looking toward the future, one searches for trends that may be projected ahead, or, alternatively, for cycles or periodicities. Both of these are in evidence on figure 2. The cyclic tendency seems to be dampening—that is, less pronounced in the more recent than in the earlier part of the record. There is a slight downward trend which, if projected to the year 2000, would indicate that river flows might average 10 percent lower than during the average of the past record. A downward trend is even more marked in the southern intermountain region. (See figure 3.)

Interpretation of the trend is uncertain. Assuming that the index records used in this study have been properly selected to reflect natural runoff and to exclude the effects of the steadily increasing diversions for use, the simplest explanation is that the downward trend is only an artifact of the period of record. There is evidence, for example, that the high runoff during the period from 1905 to 1930 was preceded by low flows, during the latter part of the 19th century. Or, considering the recent end of the record, much of the trend disappears for the record through 1975, omitting two recent dry years, which include 1977, the driest year of record.

Walter B. Langbein

Note: The graphs on figures 2 and 3 are based on maps showing ratios to normal annual runoff by years, such as those published in U.S. Geological Survey Water-Supply Paper 1669S.

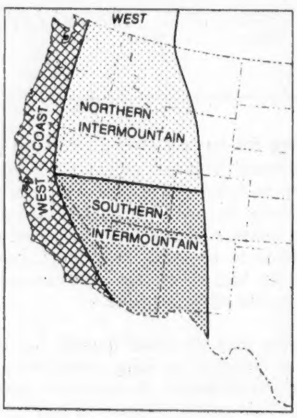

Figure 1.—Map of the western part of the conterminous 48 States, showing the area referred to in the text as the "West" and its subdivisions.

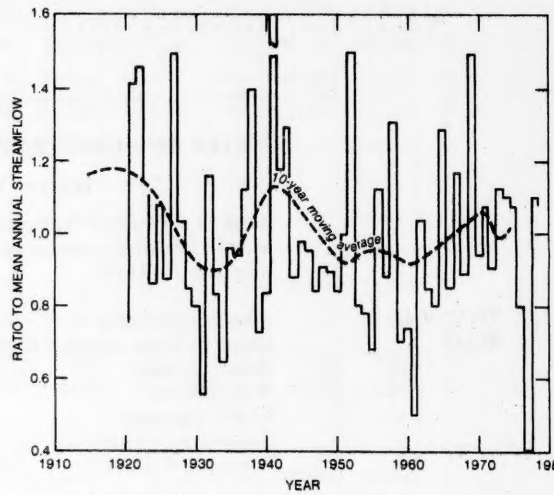

Figure 2.—Variations in annual streamflow in the West.

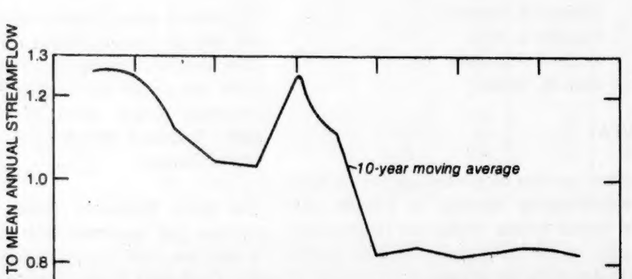

Figure 3.—Variations in the 10-year mean flows in the Southern Intermountain Region.